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(54) Production of ceramic honeycomb structural bodies.

(57) A process for producing a ceramic honeycomb structural body comprises the steps of: producing a ceramic honeycomb fired body by shaping a ceramic material by extrusion, and drying and firing the shaped body; removing a peripheral portion of the ceramic honeycomb fired body by working; and forming an outer wall portion around an outer peripheral surface of the worked ceramic honeycomb fired body. Improved mechanical strength and dimensional precision can be achieved.

EP 0 449 556 A2

First, a shaping aid and/or a pore-forming agent is added into and mixed and kneaded with a cordierite-producing material so as to plasticize the resulting ceramic material to be shaped by extrusion. Then, a ceramic honeycomb shaped body is obtained by shaping the ceramic material through extrusion. The cordierite-producing material forms a low expansion cordierite ceramic on firing, and is composed of fine talk, kaoline, alumina and another cordierite-producing material. It is particularly preferred that the fine powder of talk used is one having a low content of an alkaline component. Further, in order to make talk and kaoline fine, it is preferable to use calcined talc and calcined kaoline which can effectively control occurrence of cracks in honeycomb structural bodies due to shrinkage on drying and firing. Their grain size is preferably the same as that of non-calcined talc and kaoline.

As the shaping aid, an appropriate one is selected depending upon use, for example, among organic binders such as methyl cellulose, carboxymethyl cellulose, polyvinyl alcohol, starch glue, wheat powder, and glycerin, a surface active agent and wax. As the pore-forming agent, an appropriate one is selected preferably, for example, among graphite, starch powder and sawdust.

The state of ceramic honeycomb extrusion-shaped body will be explained below.

As shown schematically in Fig. 2, a ceramic material is continuously extruded through a die 2 of a plunger type shaping machine 1 to obtain a long ceramic honeycomb shaped body 3 by extrusion. With the extrusion, receiving tables 5 are successively supplied near the die 2 by vertically moving a receiving table-feeding unit 4 as shown by arrows, so that the the ceramic honeycomb shaped body 3 is received on the tables 5, and moved left by a roller conveyor 6 as shown in Fig. 2.

Fig. 3 shows a sectional view of the honeycomb shaped body including the receiving table taken along a line III - III for the ceramic honeycomb shaped body 3. As shown, the ceramic honeycomb shaped body 3 is stably placed inside a channel 5a of the receiving table 5. In Fig. 3, a reference numeral 7 is a spacer lying between the tables 5. Fig. 4 is an enlarged view of a portion B in Fig. 3. As shown, a number of deformed cells 8 in which partition walls are bent are formed in a peripheral portion 10 of the ceramic honeycomb shaped body 3.

In the present invention, the ceramic honeycomb fired body is then produced by drying and firing the ceramic honeycomb shaped body.

Next, the peripheral portion of the ceramic honeycomb fired body is removed by working, preferably by grinding, to make the size of the fired body smaller than an intended size. Finally, the outer peripheral surface of the ceramic honeycomb fired body having the outer peripheral portion removed is coated with a coating material, which is dried to cure the coating material and produce the ceramic honeycomb structural body having the intended size.

When the peripheral portion of the ceramic honeycomb fired body is removed by working, it is preferable that the peripheral portion of the fired body is removed by a thickness corresponding to two or more cells from the outer peripheral surface, more preferably by a thickness corresponding to two to four cells.

Since the peripheral portion of the ceramic honeycomb fired body is removed by grinding in the process for producing the ceramic honeycomb structural body according to this example, the deformed cells existing in this peripheral portion can be removed. Further, even if the circularity of the entire ceramic honeycomb fired body is small, the circularity and the dimensional precision can be increased by grinding.

Furthermore, since the outer wall portion is formed by the steps of removing the deformed cells through grinding, coating the coating material onto the outer peripheral surface of the ground ceramic honeycomb body, and drying the coating material, mechanical strength of the ceramic honeycomb structural body can be increased.

Moreover, since the coating material is not fired, the dimensional change or the deterioration in the circularity of the ceramic honeycomb structural body due to firing of the coating material can be avoided.

As mentioned above, it is desired that no firing is effected after the outer peripheral surface of the ceramic honeycomb fired body is coated with the coating material. However, such firing may be necessary depending upon uses. That is, the honeycomb fired body coated with the coating material may be fired in a case where high thermal shock resistance is demanded, and a dimensional change of the structural body due to firing is small.

The outer peripheral surface of the ceramic honeycomb fired body is ground preferably by means of a grinding stone at a peripheral speed of 750 to 2,100 m/min, more preferably 1,300 to 1,500 m/min of the grinding stone. If the peripheral speed is less than 750 m/min, it takes a long time to grind, so that the cost of the product becomes unnecessarily increase. If the grinding speed is more than 2,100 m/min, it is feared that the ceramic honeycomb fired body is cut or broken, and a desired dimensional precision cannot be obtained.

The grinding is effected preferably at the grinding speed of 0.7 to 0.9 mm. If the grinding speed is less than 0.7 mm/sec, the working time unfavorably becomes longer. On the other hand, if it is more than 0.9 mm/sec, pitching problem occurs to shorten the service life of the grinding stone.

eycomb structural body may be elliptical, rectangular or other asymmetrical shape.

Further, although the sectional shape of the cells is square in the above example, this is not restrictive. For example, the shape of the cell may be triangle or hexagonal.

In addition, although cordierite is used as the material in the above example, this is not restrictive. Furthermore, the invention may be applied to the honeycomb structural body in which opposite end faces of cells are alternatively closed.

According to the process for producing the ceramic honeycomb structural bodies in the present invention, since the peripheral portion of the ceramic honeycomb fired body is removed by working, the deformed cell existing there can be removed. Further, even when the ceramic honeycomb fired structural body totally has low circularity, its circularity can be increased by the above working to improve the dimensional accuracy.

Furthermore, since the deformed cells having low strength are removed by working and then the outer peripheral wall is formed around the outer peripheral surface of the ceramic honeycomb fired body, mechanical strength of the ceramic honeycomb structural body can be highly increased. As a result, sufficient strength can be imparted upon conventional fired products having insufficient strength due to deformation of cells in the peripheral portion by the producing process according to the present invention, so that the yield of products can be increased.

Claims

1. A process for producing ceramic honeycomb structural body, comprising the steps of:
   obtaining a ceramic honeycomb fired body by shaping a ceramic material by extrusion, and drying and firing the shaped body;
   removing a peripheral portion of the ceramic honeycomb fired body by working; and
   forming an outer wall portion around an outer peripheral surface of the worked ceramic honeycomb fired body.

2. The producing process according to Claim 1, wherein the outer wall portion is formed by coating the outer peripheral surface of the ceramic honeycomb fired body with a coating material after the working and then drying the coating material.

3. The producing process according to Claim 2, wherein the outer peripheral surface of the ceramic honeycomb fired body is coated with the coating material containing a ceramic powder, ceramic fibers and a binder.

4. The producing process according to Claim 2 or 3, wherein a viscosity of the coating material used for the coating is not less than 100 poises and not more than 200 poises.

5. The producing process according to Claim 1, wherein the peripheral portion of the ceramic honeycomb fired body is removed by grinding off said outer periphery with a grinding stone at a peripheral speed of 750 to 2,100 m/min and at a working speed of 0.7 to 0.9 m/sec.

FIG_2

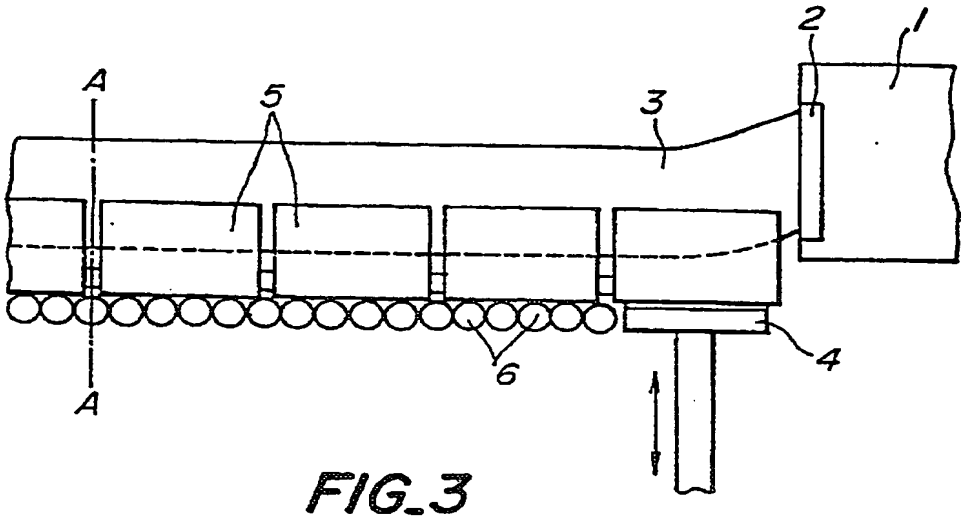


FIG_3

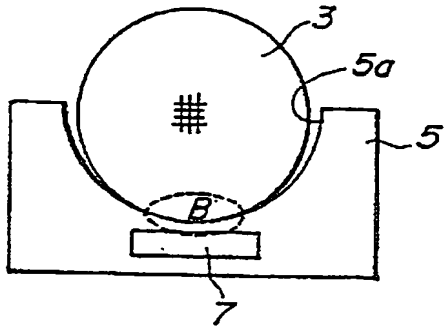
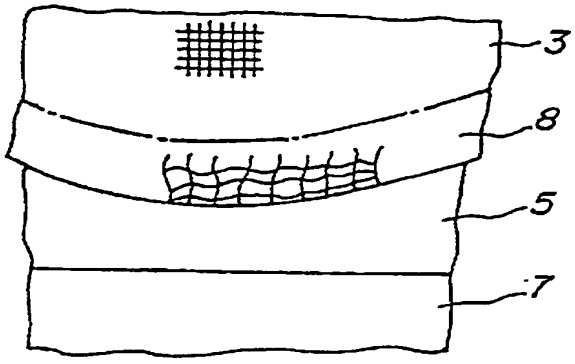


FIG_4



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EUROPEAN SEARCH REPORT

Application Number

EP 91 30 2585

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y	EP-A-221 515 (AIR PRODUCTS AND CHEMICALS, INC.) * page 1, line 1 - line 38 * * page 3, line 20 - line 54 * * page 4, line 41 - page 5, line 21; claim 1; examples 3-4 *	1-4	C04B41/50
Y	EP-A-283 224 (NGK INSULATOR, LTD.) * abstract; claims 1,4-6,8 * * column 1, line 1 - line 54 * * column 2, line 39 - column 4, line 8 *	1-2	
Y	US-A-3 876 556 (E. LAACK ET AL) * abstract; claims 1-6 * * column 1, line 1 - column 3, line 2 * * column 3, line 39 - column 5, line 51 *	3	
A		1-2,4	
Y	EP-A-295 343 (NGK INSULATORS, LTD.) * abstract * * page 3, line 1 - page 4, line 8 *	4	
A	GB-A-2 071 639 (NIPPON GIASHI K.K.) * page 1, line 1 - line 24 * * page 2, line 7 - line 30 *	1,3	TECHNICAL FIELDS SEARCHED (Int. Cl.5) C04B B24B
A	GB-A-2 071 640 (NIPPON GIASHI K.K.) * page 1, line 1 - line 43 * * page 2, line 3 - page 3, line 10 *	1-3	
A	PATENT ABSTRACTS OF JAPAN, File Supplier JAPS. &JP-A-1176285(Nippon Denso Co Ltd)12-07-1989 * Abstract *	1,3	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	06 SEPTEMBER 1991	OLSSON S.A.

CATEGORY OF CITED DOCUMENTS

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